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# Problems in Family Practice

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## Spinal Deformity

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Early results of scoliosis screening programs have demonstrated that mild spinal deformity is common, usually non-progressive, and often requires no specific treatment. The role of the primary care physician is an important one in identifying the rare case, which is secondary to some underlying disorder which itself requires treatment, and the progressive curves, which should be managed by bracing. The informed physician can make this separation efficiently with minimum cost to the family and minimum radiation exposure to the patient.

The introduction of mass screening programs is revolutionizing the management of spinal deformity in children and adolescents. Early detection allows the control of progressive curves with braces which might otherwise have progressed undetected to the degree that requires surgical instrumentation and fusion. The detection of large numbers of minor curves has also posed new questions, such as the indications for radiographic examination and the role of the primary care physician in management. This paper suggests a way by which the primary care physician may manage these now common problems.

### Spinal Deformity

The embryonic spine is normally "C" shaped in the sagittal plane. When the infant begins to stand,

compensating lumbar and cervical curves normally develop. Lateral curvature is not usual at any stage.

Deformity may occur in the frontal plane as scoliosis or in the sagittal plane as excessive thoracic kyphosis or lumbar lordosis.

*Scoliosis* may occur either as a primary or secondary deformity. The familial or "idiopathic" form is most common. Other causes include congenital structural deformities such as hemivertebrae, connective tissue abnormalities such as neurofibromatosis, and neuromuscular disorders such as cerebral palsy. Scoliosis may also be secondary to inflammation from arthritis or infection, or to a neoplasm. Scoliosis may occur as a compensation for leg length inequality; this last type of curve remains "functional" and benign in childhood.

*Kyphosis* is abnormal if in excess of 40 degrees; it may also be primary or secondary to another condition. As with scoliosis, excessive kyphosis is often familial but may be due to some congenital anomalies of bone, connective tissue, or the nervous system. It may be secondary to a developmental disorder, "juvenile kyphosis," an osteochondrosis of the vertebral body resulting in a wedge shaped vertebra. Finally, functional kyphosis may be seen in asthenic adolescents, in tall

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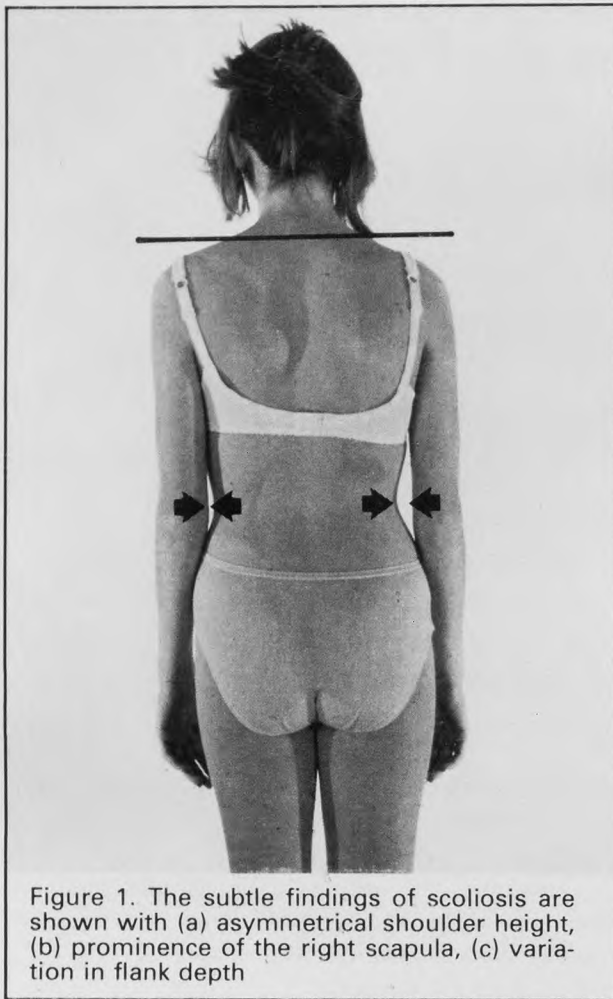


Figure 1. The subtle findings of scoliosis are shown with (a) asymmetrical shoulder height, (b) prominence of the right scapula, (c) variation in flank depth

girls who slouch to reduce their height, or in girls who are self-conscious about their breast development.

*Lordosis*, like *kyphosis*, is normal unless excessive. It is fairly commonly seen in otherwise normal prepubescent children and seems to resolve spontaneously. Rigid forms are pathological but fortunately are rare.

### Evaluation

The primary care physician usually sees the patient with scoliosis when he or she is referred from a school screening program or comes for a routine physical examination.

### Examination

The physician should begin by observing the child's overall posture. Modest girls are more comfortable when examined in back-opening gowns. A back view of the child standing in the anatomical position (Figure 1) permits observation of (1) shoulder height; (2) scapular prominence; (3) flank crease depth; and (4) pelvic symmetry for evidence of leg length inequality.

From the side, the examiner may note the thoracic *kyphosis* and lumbar *lordosis*. Long hair should be pinned up or held up by a parent during this assessment. What is excessive is a subjective judgment. In attempting to answer this question, one might ask, "Is this round back (*kyphosis*) or swayback (*lumbar lordosis*) acceptable to you for the rest of your life?"

Observing the girl patient from the front may be omitted if the back and side views are normal. If abnormality is present, one should check for frontal thoracic symmetry and breast asymmetry.

### Forward Bending Examination

Examination of the child's back as he or she gradually bends forward is the next step. If a leg-length difference was found, before conducting the forward bending examination the pelvis should be leveled by placing blocks or books under the short side. This examination is best performed while seated in front of the patient (Figure 2). The front view is better as any asymmetrical hand placement may produce spurious asymmetry and this cause may not be appreciated when the examiner is seated behind the child.

The child's hands are placed in a symmetrical "diving position," and the neck is flexed to bring the chin to the chest. With one hand holding the patient's hands to control the rate and degree of forward flexion, the examiner scans each level of the spine for asymmetry during bending. Because *scoliosis* is associated with rotation of the vertebrae, one side of the thorax or flank will be higher on the convex side of the curve (Figure 3). Thus, a child with the usual right thoracic idiopathic (familial) *scoliosis* will show prominence of the right thorax.

If an excessive *kyphosis* was found on standing examination, the examiner should ask the child to perform the forward-bending examination as he watches from the side to note whether the *kyphosis* is round or angular. The angular form is



Figure 2. The forward bending examination is best performed in this fashion allowing control of the rate and degree of forward bending and symmetrical positioning of the patient's hands. Each level of the spine should be assessed for evidence of asymmetry

more rigid and thus more significant. Also, lumbar lordosis is normally lost with forward bending; its persistence is indicative of a rigid lordosis which is abnormal.

*If deformity is found*, it is necessary to screen for other associated problems. First, a thorough history is taken. The physician should ask if there has been known spinal deformity, back pain, weakness, loss of running speed, and family history of spinal deformity. Next, he/she should look at the skin for the cafe au lait spots of neurofibromatosis. Does the child have other skeletal or neuromuscular abnormalities such as deformity or short stature? A screening neurological examination should include testing for atrophy, motor weakness, reflexes, straight leg raising, and back stiffness. The physician should request parents

and siblings who accompany the patient to perform the forward-bending test. It is surprising how often the physician will find in a parent a deformity that was previously unrecognized.

### Management

Patients need to be divided first into three categories. (1) Patients with a normal examination require only reassurance. (2) Patients with mild flexible deformity can be managed by the primary care physician. This group will include the vast majority of patients and will be discussed in more detail. (3) Patients with prominent curves or who have some "red flag," such as pain or other abnormalities found on screening, should be referred. Such referrals should be made without



Figure 3. The forward bending position allows subtle differences in thoracic height to be observed

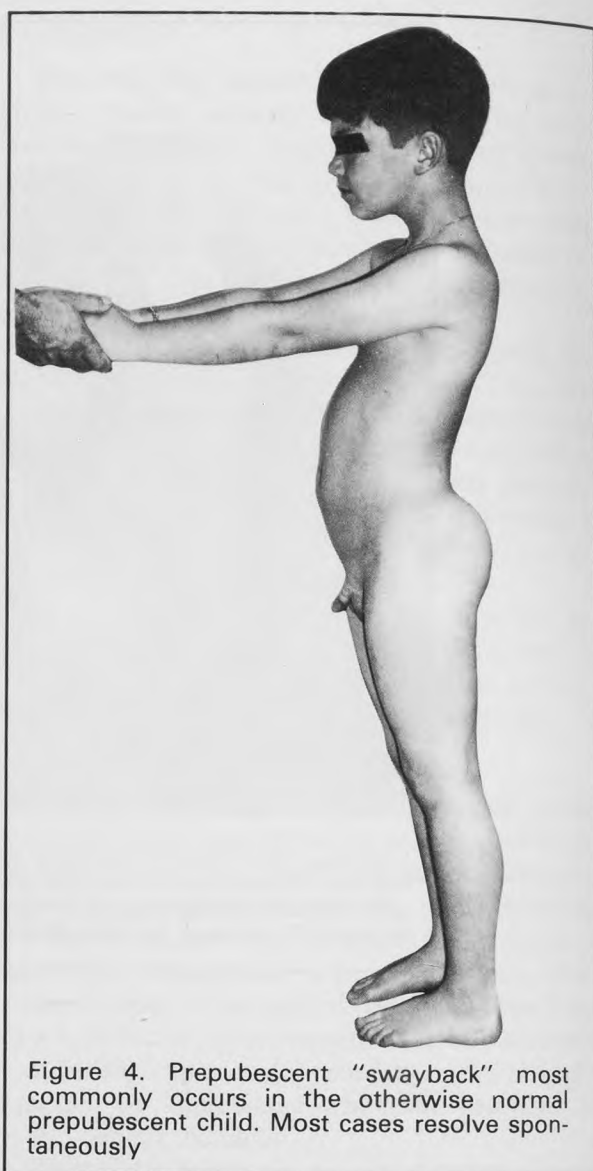


Figure 4. Prepubescent "swayback" most commonly occurs in the otherwise normal prepubescent child. Most cases resolve spontaneously

radiographs because these are best made by the consultant.

*Prepubescent swayback (hyperlordosis)* which is flexible and not associated with any other findings (Figure 4) can be observed at six-month intervals. Abdominal strengthening exercises such as sit-ups with the knees bent may be suggested, but the value of exercise is not established. A lateral Polaroid photograph is an ideal method of following these patients. Persistence or increasing deformity is an indication for referral.

*A round back deformity (kyphosis)* which is not severe, is flexible, and shows a smooth and even curve on the forward bending test, may be observed for six months. An exercise program which includes spine hyperextension and sit-ups for 15

minutes twice daily may be suggested. To be effective the exercises should be pushed to the point at which the child experiences fatigue. If the deformity persists, was clearly unacceptable when first seen (Figure 5), or is associated with other problems such as pain, a referral is appropriate.

*Idiopathic scoliosis* accounts for the vast majority of spinal deformities to be managed. The first objective of management is to separate curves greater than 15 degrees and refer these, as they are often progressive and may require bracing.

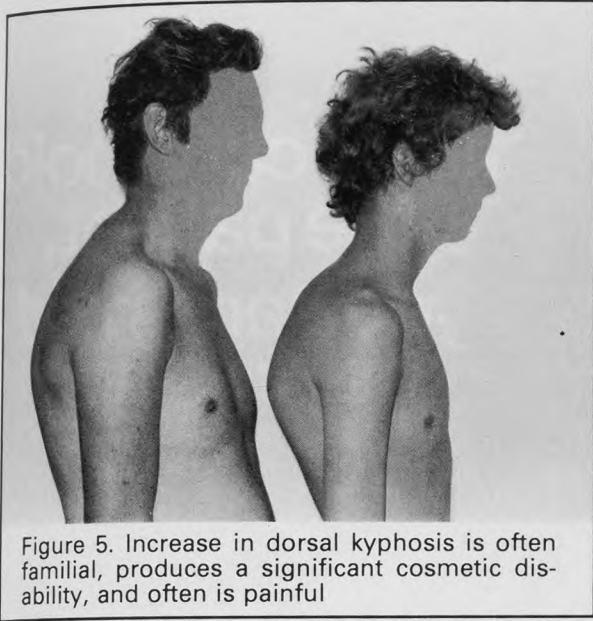


Figure 5. Increase in dorsal kyphosis is often familial, produces a significant cosmetic disability, and often is painful

How clinically obvious a 15-degree curve is depends upon several factors: (1) Level: thoracic curves are more apparent than lumbar curves; (2) Balance: a compensated curve such as a double major curve will be less apparent than an uncompensated curve; and finally (3) Obesity: this makes a curve less obvious. For most observers a 15-degree curve is usually readily apparent.

A very slight curve may be observed at four- and then six-month intervals until it is clear that the curve is not progressing or the patient is mature, which is about 15 years for girls and 17 years of age for boys.

Slight curves are an indication for a single standing anterior-posterior (AP) radiograph as part of the initial evaluation (Figure 6). If the curve measures more than 15 degrees, the patient should be referred. If between 10 and 15 degrees, then a second standing AP radiograph in four to six months is appropriate. If less than 10 degrees—especially if less than 5 degrees—a second radiograph could be made if the clinical evaluation after four to six months suggests the curve is increasing.

Moderate or severe curves should be referred without radiographs.

Thus for mild, uncomplicated curves of the idiopathic type—less than 15 degrees—only ob-

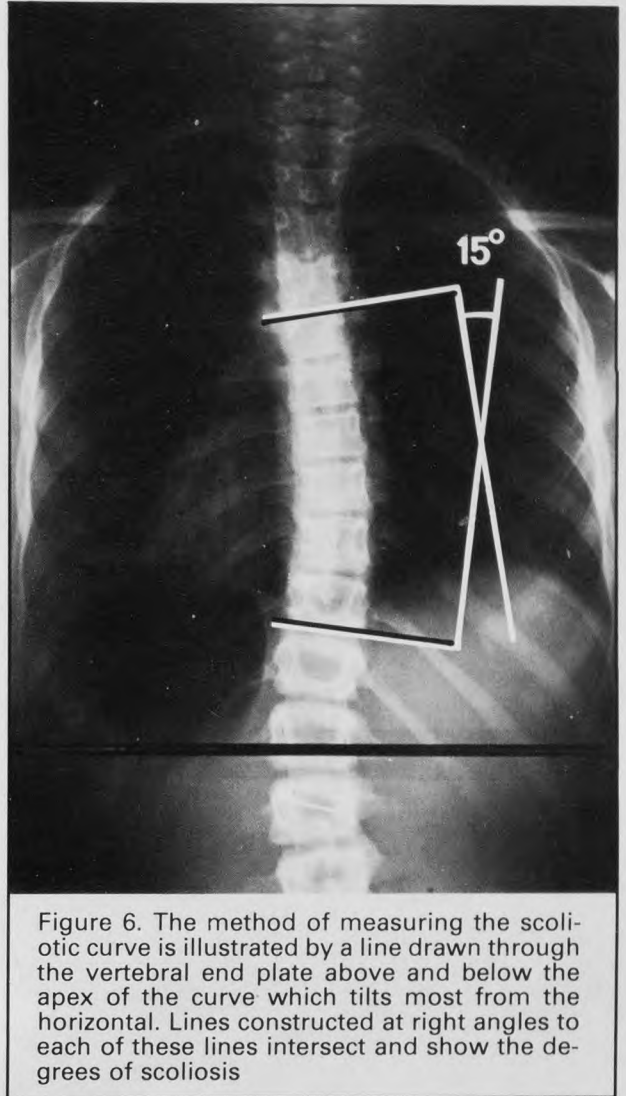


Figure 6. The method of measuring the scoliotic curve is illustrated by a line drawn through the vertebral end plate above and below the apex of the curve which tilts most from the horizontal. Lines constructed at right angles to each of these lines intersect and show the degrees of scoliosis

servation is necessary. The patient should not be restricted in activity. Special exercises have not been found to be useful.

### What The Orthopedist Does

Most orthopedists recommend bracing for progressive scoliotic curves between 20 and 40 degrees and kyphotic curves between 50 and 65 degrees in the skeletally immature patient. Curves beyond that level may require instrumentation and fusion for correction.